PATENT

#20 7/25/03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	**John Chen and Lixiao Wang Yiqun Wang and Albert C. C. Chin**
Application No.:	**09/696378**
Filed:	**October 25, 2000**
For:	**DIMENSIONALLY STABLE BALLOONS**
Examiner:	**Sow-Fun Hon**
Group Art Unit:	**1772**

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Docket No.: S63.2-9503-US01

BRIEF ON APPEAL

This is a Brief on Appeal for the above-identified application in which claims 1-26 and 31-36 were finally rejected in an Office Action mailed November 21, 2002. A Notice of Appeal was filed in this case on March 20, 2003. The fees required under §1.17(f) and any required petition for extension of time for filing this brief therefor are dealt with in the accompanying Transmittal of Appeal Brief. This brief is transmitted in triplicate in accordance with 37 C.F.R. §1.192(a).

(1) Real Party in Interest

The application is assigned to SciMed Life Systems, Inc., One SciMed Place, Maple Grove, MN 55311-1566, a Minnesota Corporation and a subsidiary of Boston Scientific Corporation, One Boston Scientific Place, Natick, Massachusetts, 01760-1537, a Delaware Corporation.

(2) Related Appeals and Interferences

No related appeals or interferences are pending.

(3) Status of Claims

Claims 1-26 and 31, 33, 36 are pending in the application. Claims 1-26 and 31, 33 and 36 are reproduced in Appendix A, have been finally rejected and are the subject of this appeal.

(4) Status of Amendments

All amendments made to date have been entered.

(5) Summary of the Invention

The present application is generally directed to a stent delivery balloon composed of a micro-composite material which includes a longitudinal fibril structure that is either parallel to the longitudinal axis of the balloon structure, or that is diagonal to the longitudinal axis at the molecular level of the balloon. The orientation of the fibril structure can limit longitudinal expansion of the balloon and allow the balloon to expand radially as desired, but minimally, or not at all in the longitudinal direction if the fibrils are parallel to the balloon axis. When the fibrils are oriented diagonally about the axis, they can limit both longitudinal and radial expansion of the balloon when inflated.

The micro-composite material is made up of a combination of a fibril component, a polymeric balloon material which acts as a matrix, and optionally a compatibilizer material which may act to create a less distinctive phase boundary between the fibril and matrix components, but which does not solubilize the LCP polymer in the matrix at human body temperature.

Although such materials have been employed for catheter *tubing*, such material has not been known for use in the construction of catheter *balloons* which exhibit minimal or no longitudinal growth during balloon expansion but which expands as desired in the radial direction, or that exhibit minimal expansion both in the longitudinal and radial directions.

The invention of claim 1 is directed to a dimensionally stable polymer balloon having a longitudinal axis and composed of a micro-composite material, the micro-composite material including a polymer matrix component and a polymer fibril component distributed in the polymer matrix component, the fibril component having micro-fibers oriented substantially parallel or diagonally to the longitudinal axis of the balloon.

The invention of claim 8 is directed a polymer balloon as in claim 1 wherein the micro-composite material further includes a compatibilizer component.

The invention of claim 9 is directed to a polymer balloon as in claim 8 wherein the compatibilizer is a block copolymer.

The invention of claim 10 is directed to a polymer balloon as in of Claim 8 wherein said compatibilizer is selected from the group consisting of copolyester elastomers, ethylene unsaturated ester copolymers, copolymers of ethylene and a carboxylic acid or derivative thereof, polyolefins or ethylene-unsaturated ester copolymers grafted with functional monomers, copolymers of ethylene and a carboxylic acid or derivative thereof, terpolymers of ethylene, copolymers of unsaturated esters and carboxylic acids or derivatives thereof, maleic acid grafted styrene/ethylene-butadiene-styrene block copolymers, acrylic elastomers, glycidyl(meth)acrylates, ionomeric copolymers, polyester-polyether block copolymers, and mixtures thereof.

The invention of claim 11 is directed to a polymer balloon as in claim 1 wherein the compatibilizer is an ethylene-maleic anhydride copolymer, an ethylene-methyl acrylate copolymer, an ethylene-methyl acrylate-maleic anhydride terpolymer, an ethylene- methyl acrylate-methacrylic acid terpolymer, an alkyl(meth)acrylate-ethylene-glycidyl(meth)acrylate terpolymer, or a mixture thereof.

The invention of claim 16 is directed to a polymer balloon as in claim 1 wherein the fibril component has a melting point of about 250° C or less.

The invention of claim 17 is directed to a polymer balloon as in claim 1 wherein the fibril component has a melting point of about 150° to about 249° C.

The invention of claim 18 is directed to a polymer balloon as in claim 1 wherein the fibril component has a melting point of about 230° C or less.

The invention of claim 31 is directed to an inflatable medical balloon having a circumference and a longitudinal axis including a semi-compliant matrix having a plurality of individual fiber cores mixed therethrough. The cores are evenly distributed about the circumference of the balloon and are composed of one or more materials which are characterized as being stronger than the matrix material and having a bulk elongation less than the matrix material when the one or more materials are oriented in the direction of the longitudinal axis, and the matrix material and the core material operatively adhering to one another.

The invention of claim 33 is directed to a medical balloon as in claim 31 that expands less than 5% beyond the pre-inflation state.

(6) Issues

I. Whether the Examiner erred in rejecting claims 1-8, 12-26, 31, 33 and 36 under 35 U.S.C. §103(a) as being obvious over LeVeen et al. (US 4,448,195) in view of Zdrahala.

II. Whether the Examiner erred in rejecting claims 9-11 under 35 U.S.C. §103(a) as being unpatentable over LeVeen et al. in view of Zdrahala as applied to claims 1-8, 12-26, 31, 33 and 36, and further in view of Cozewith et al.

(7) Grouping of Claims

For issue I, claims 1-8, 12-15, 19, 20-26 and 36 stand or fall together.

For issue I, claims 16-18 stand or fall together.

For issue I, claim 31 stands or falls alone.

For issue I, claim 33 stands or falls alone.

For issue II, claim 9 stands or falls alone.

For issue II, claims 10-11 stand or fall together.

8) Argument

I. The Examiner erred in rejecting claims 1-8, 12-26, 31, 33 and 36 under 35 U.S.C. §103(a) as being obvious over LeVeen et al. (US 4,448,195) in view of Zdrahala.

A. Claims 1-8, 12-15, 19, 20-26, and 36.

Claim 1 is representative. Claim 1 is directed to a dimensionally stable polymer balloon having a longitudinal axis and composed of a micro-composite material, the micro-composite material including a polymer matrix component and a polymer fibril component distributed in the polymer matrix component, the fibril component having micro-fibers oriented substantially parallel or diagonally to the longitudinal axis of the balloon.

In the Final Action it was asserted that LeVeen et al. has a balloon catheter wherein the balloon and catheter are a one piece unit with the balloon being a thin catheter wall portion of exact shape and size, and that it can be formed by expanding a distal tube portion of the catheter and that LeVeen et al. teaches that the catheter may be formed by blow molding tubing with fine fibers, but fails to teach that the fibers are polymeric or the orientation of the fibers.

The Examiner cites Zdrahala as teaching extruded catheter tubing of LCP polymer fibers in a matrix polymer. In the last paragraph on page 3, the Final Action asserts that Zdrahala teaches that the tube may be extruded with no relative rotation between orifice and mandrel, but with stretching imposed by orienting the apparatus, with the result that the fibrils of such tubing are generally parallel to the tubing axis where such a structure tends to have relatively high longitudinal stiffness, which means that the longitudinal elongation of the catheter section would be minimal, and precludes longitudinal expansion of 5% beyond the original pre-inflation state. The Examiner goes on to assert that it would have been obvious to one of ordinary skill in the art to have used the catheter tubing of Zdrahala for one-piece balloon catheter in the invention of LeVeen et al. in order to obtain a balloon catheter with the desired longitudinal stiffness for facilitating advancement through small arteries and veins.

Appellants disagree.

The Examiner has clearly misread LeVeen et al.

LeVeen et al. teaches a one piece balloon catheter which is formed by blow molding an elongated polyurethane tube so that one section of the tube has a thinned cross sectional balloon area between the distal end of the tube which is sealed and its open proximal

end. The balloon portion which is positioned adjacent the distal end has a thinner cross sectional area which allows a balloon to be formed if a fluid is introduced into the catheter. The Examiner has cited col. 1, lines 5-50, in asserting that LeVeen et al show a fiber-containing balloon. The closest statement which can be found is the following:

> The catheter and balloon are a one piece unit with the balloon being a thin catheter wall portion of exact shape and size. *The catheter may be formed by blow molding tubing with a fibrous reinforcement of woven glass or fine fibers of other materials.* The woven fiber structure is placed over a polyurethane extruded plastic tubing which is heated and the blown outward into a mold. The molded polyurethane is then fused with the reinforcement fiber during this procedure.
>
> Col. 1, lines 44-54

Perhaps the Examiner reasons that the balloon portion of the catheter is the same as the shaft portions. Perhaps the Examiner has misinterpreted LeVeen et al. because of the discussion of blow molding, and has confused the catheter shaft and balloon portions. Either way, the Examiner is incorrect. LeVeen et al go on to expressly teach omitting the fiber component from the portion of the tubing which is used to form the balloon. Hence an inference that the catheter shaft and balloon portions are the same is wrong. Moreover, the mention of blow molding does not suggest to reinforce the balloon. In fact the catheter shaft is blow molded into the reinforcing material.

LeVeen et al. expressly omit the fiber component from the thinned portion of the catheter which forms the balloon. In particular, at Col. 2, lines 42-59, the patent states:

> The portion 12 is thinned so that when a fluid 14 is introduced under pressure into the tubular catheter, a balloon 16 will form in the thinned portion 12. The tubular catheter 10 may be formed by sealing a distal end 15 of a polyurethane extruded tubing and placing the tubing within a mold lined with a reinforcement netting structure 110, preferably of woven glass fibers. ***The mold M partially shown in phantom in FIG. 5 includes a wider portion 50*** adjacent the sealed distal portion 15 of the tube ***where the reinforcement lining structure is omitted.*** The tubing is heated and blown outward to fuse with the reinforcement glass fiber structure, as well as to create a thinned out portion 12 of a size

> and position corresponding to that of the wider portion of the mold described above. The balloon portion thus is thinned with respect to the other portions of the tube and has an exact shape and size. (emphasis added)

The portion from which the netting structure is omitted in Fig. 5 is the portion which forms the balloon. Hence the catheter is formed by blow molding tubing with a fibrous reinforcement of woven glass or fine fibers of other materials, but the integral balloon has no such reinforcement.

Figures 5 and 6, shown below also clearly depict the balloon as free of the reinforcement material:

Fig. 5

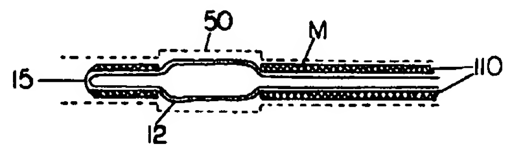
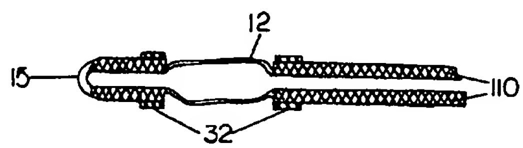


Fig. 6



The LeVeen et al patent also contains this further teaching:

> While the ***balloon 16 is without reinforcement***, it is also constrained by the occlusion 100 and will not expand to the point where the tensile strength of the balloon 12 equals the tension thereon. (emphasis added, col. 3, lines 29-39)

Thus, the Examiner's interpretation is flawed.

LeVeen et al teaches the opposite of the Examiner's position. Instead of suggesting the invention, LeVeen et al. actually teaches away from the invention. If someone were to fashion an integral balloon catheter using catheter tubing as described in Zdrahala, LeVeen et al clearly teaches to <u>omit</u> the fiber in the portion of the tubing which would form the balloon.

No *prima facie* case of obviousness has been made out. Neither Zdrahala nor LeVeen et al. teach a balloon. Thus, the combination of references is lacking a most important element of the present claims, i.e. the polymer *balloon* as taught and claimed in the present application. Consequently, at least for this reason the rejection of claims 1-8, 12-15, 19, 20-26 and 36 should be reversed.

B. Claims 16-18

Claims 16-18 are patentable over LeVeen et al. in view of Zdrahala for at least the reasons that claim 1 is patentable (*i.e.* that LeVeen et al has been misinterpreted), and also for the reason that the use of low melting point fibril components recited in these claims are not taught or suggested in either document.

Claim 16 is directed to an embodiment of a polymer balloon in which the fibril component has a melting point of about 250°C or less. Claim 17 is directed to an embodiment in which the polymer balloon includes a fibril component having a melting temperature of about 150°C to about 249°C. Claim 18 is directed to an embodiment in which the polymer balloon includes a fibril component having a melting point of 230°C or less. Lower melting temperatures are advantageous because they require lower processing temperatures which are beneficial both from a personal safety perspective, are less detrimental to polymer properties during processing, and are more economical.

The liquid crystal polymers disclosed by Zdrahala have melting temperatures which are higher than those embodiments found in claims 16-18. Indeed, Zdrahala does not teach a fibril component having a melting point less than 280°C. For example, VECTRA®

B950, disclosed at col. 6, lines 48-49, has a melting point of 280°C.[1] Appellants submit that it is in fact *unusual* for these types of polymers to have melting temperatures of less than 280°C.

Appellants are also submitting in Appendix B, references illustrating that the polymers sold under the tradename of both VECTRA® and XYDAR® generally have higher melting temperatures than those of the fibril component recited in claims 15-18. Therefore, the rejection of claims 16-18 should be reversed for at least the reasons that LeVeen et al has been misread and further because the compositions of Zdrahala do not include a fibril component having a melting point as low as recited in these claims.

C. Claim 31

Claim 31 is directed to a medical balloon formed from a combination of a semi-compliant matrix material and a plurality of individual fibril cores distributed evenly about the circumference of the balloon. See application, page 6, line 29-page 7, line 22. The embodiment of claim 31 therefore requires both a particular type of matrix material and a non-random distribution of the fibril cores.

Claim 31 is seen to be patentable over the combination of LeVeen et al and Zdrahala for the same reason that claim 1 is patentable (*i.e.* that LeVeen et al has been misread), and also because Zdrahala does not teach or suggest the structured composition as recited.

Zdrahala, which is relied upon for the composition, does not show evenly spaced cores, nor does it teach or suggest the specific combination of such cores with a semi-compliant matrix material. The Zdrahala matrix materials cover a range of compliance, including materials

[1] Heino et al., US Patent No. 6,221,962 B1; Baird, US Patent No. 5,834,560

which can be characterized as semi-compliant,[2] but unlike the embodiment found in claim 31 of the present application, Zdrahala fails to teach or suggest employing a certain compliance material in combination with a plurality of individual fibril cores evenly distributed about the circumference of the balloon.

Thus, the combination of references does not suggest the specific combination of materials found in claim 31 of the present application for use in a polymer balloon. Therefore, even if the combination of LeVeen et al. and Zdrahala was a viable rejection of claim 1, the combination would not create a *prima facie* case of obviousness with respect to claim 31 and its dependents.

E. Claim 33

Claim 33 depends from claim 31 and is seen as being patentable for the same reasons already described for claim 31. Additionally, the recitation of the balloon longitudinal expansion rate of less than 5% is not taught or suggested in either reference.

In this particular, Appellants note that the longitudinal expansion property of a balloon is quite different than that of catheter tubing. Balloons have different wall thicknesses and undergo different processing than catheter tubing. Consequently, a skilled person does not know what longitudinal expansion would be obtained using a material for catheter tubing to form a balloon both because the balloon is further processed beyond what tubing is, and because the wall thickness of a balloon is thinner. Thus, the longitudinal expansion of a balloon would not

[2] See, for example, U.S. Patent Nos. 6,406,457; 6,171,278; 6,146,356; 5,951,941; 5,830,182; 5,556,383; 5,500,181; 5,447,497; 5,403,340; 5,348,538

be predictable from catheter tubing. Longitudinal expansion with respect to balloons is discussed in the Background at page 1 of the present specification.

Neither LeVeen et al., which describes an unreinforced balloon, nor Zdrahala, which is directed to catheter tubing, provide any direction as to a balloon having the expansion characteristics recited in this claim.

Thus, Appellants submit that the rejection of claim 33 should be reversed for the reasons given for claim 31 and also for the reason that a balloon having the longitudinal expansion property of this claim is not taught or suggested by the cited references.

II. The Examiner erred in rejecting claims 9-11 under 35 U.S.C. §103(a) as being unpatentable over LeVeen et al. in view of Zdrahala as applied to claims 1-8, 12-26, 31, 33 and 36, and further in view of Cozewith et al.

A. Claim 9

Claim 9 of the present invention is directed to a polymer balloon composed of a micro-composite material including a polymer matrix component, a polymer fibril component and a block copolymer compatibilizer. In the present specification, it is stated at page 2, lines 27-31 that the compatibilizer is employed to create a less distinctive phase boundary between the fibril and matrix components, but not to solubilize the LCP polymer in the matrix at human body.

Claims 9-11 were finally rejected in the Office Action mailed November 21, 2002 under 35 U.S.C. §103(a) as being unpatentable over LeVeen et al. in view of Zdrahala as applied to claims 1-8, 12,-26, 31, 33 and 36 above, and further in view of Cozewith et al. In the final

Office Action it is asserted that LeVeen et al. teaches a catheter balloon with reinforcing fibers, but fails to teach the compatibilizer. It is further asserted by the Examiner that Zdrahala teaches catheter tubing wherein the liquid crystal polymer ingredient may be desirably semi-compatible with the particular structural plastic matrix (column 5, lines 35-40) and that the blended composition may include block copolymers such as copolyester elastomers, polyolefins and copolymers of ethylene with acrylates (column 4, lines 15-30) and the specific use of compatibilizers (surfactants)(column 5, lines 20-35)), but that Zdrahala fails to teach that any block copolymer in the blend is specifically a compatibilizer.

As an initial matter it is noted that the rejection of claims 9-11, like that of claim 1, relies on the same misinterpretation of the LaVeen et al reference. No assertion is made that Cozewith et al teaches or suggests catheter balloon with reinforcing fibers. Consequently, this rejection must be reversed at least for the reason that the LeVeen et al document does not teach or suggest a catheter balloon with reinforcing fibers.

The Final Office Action mailed November 21, 2003, asserted at page 5:

> Because Cozewith et al. disclose that it is well known in the art to use block copolymers as compatibilizers for emulsifying polymer/polymer blends, it would have been obvious to one of ordinary skill in the art at the time of the invention to have used a block copolymer taught by Zdrahala [*sic*] as the compatibilizer in the catheter tubing of Zdrahala, in order to use the catheter tubing of Zdrahala as the catheter balloon tubing in the invention of LeVeen et al., such that a balloon catheter with the desired compatibility between matrix and fiber and thus the desired constrained inflation and longitudinal stiffness is obtained.

Appellants disagree.

Zdrahala suggests that ***surfactants*** may be employed as additives in the catheter tubing compositions, but leaves it to the reader to determine what their purpose would be:

> Other ingredients or additives may be provided to accomplish any desired purpose such as internal lubricants, pigments, radiopaque agents, surfactants, and the like.
> (col. 5, lines 25-28)

Nothing is said here suggesting that the surfactants are block copolymers or that they are to be used for polymer compatibilization. In fact, Zdrahala prefers phase incompatibility. (Col. 7, lines 32-36.) Moreover, Zdrahala's mention of block copolymers is in a general listing of matrix resins (col. 4, lines 17-31 HYTREL® and PEBAX®), and the block copolymer character of these resins is not mentioned. Consequently, absent impermissible hindsight, the passing reference to surfactants cannot be considered a suggestion to employ a block copolymer compatibilizer between the matrix and the fiber as argued in the Final Action.

Cozewith et al., US 5733980, describes block polymers containing both crystalline and elastomeric blocks. Both blocks are olefin or diene polymer segments, unlike the block copolymer resins mentioned in Zdrahala. The Cozewith et al block copolymers may be used as a lubricant or fuel additive, as a plastics blend component, in bitumen blends, as a component in hot melt adhesives and as a component of roof sheeting compounds. While Cozewith et al. do mention that block copolymers generally are known for use as compatibilizers, (column 1, lines 17-23), they do not describe block copolymer performance as a compatibilizer in relation to any polymer composition of a liquid crystal polymer. Furthermore, Cozewith et al. make no suggestion to employ the compositions described therein for the manufacture of medical devices. Consequently, there is no suggestion or motivation provided in this document to employ a block copolymer compatibilizer between the matrix and the fiber as argued in the Final Action.

Because the rejection of claim 9 relies on an incorrect reading of the LeVeen et al reference, and further because the combination of references does not teach or suggest using a block copolymer compatibilizer in a balloon formulation, the rejection of claim 9 should be reversed.

B. Claims 10-11

Claims 10 and 11 of the present application depend from claim 9 and are patentable at least for the reasons given for claim 9. Furthermore, claims 10 and 11 are directed to specific types of compatibilizers, none of which are described in Cozewith et al. Therefore, combining Cozewith et al. with Zdrahala and LeVeen et al. does not lead one of skill in the art to any of the specific compatibilizers of claims 10 and 11.

Because the rejection of claims 10 and 11 relies on an incorrect reading of the LeVeen et al reference, and further because the combination of references does not teach or suggest using a block copolymer compatibilizer in a balloon formulation, and further because the combination of references does not lead one to employ the resins recited in claims 10 and 11 as compatibilizers in a balloon polymer formulation, the rejections of claims 10 and 11 should be reversed.

IV. CONCLUSION

By the foregoing arguments it has been demonstrated that claims 1-8, 12-26, 31, 33 and 36 are not obvious over LeVeen et al. (US 4,448,195) in view of Zdrahala; and that claims 9-11 are not obvious over LeVeen et al. in view of Zdrahala as applied to claims 1-8, 12-26, 31, 33 and 36, and further in view of Cozewith et al.

Respectfully submitted,

VIDAS, ARRETT & STEINKRAUS

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Appendix A

CLAIMS ON APPEAL

1. A dimensionally stable polymer balloon having a longitudinal axis and composed of a micro-composite material, the micro-composite material comprising a polymer matrix component and a polymer fibril component distributed in the polymer matrix component, the fibril component having micro-fibers oriented substantially parallel or diagonally to the longitudinal axis of the balloon.

2. The dimensionally stable polymer balloon of claim 1 mounted on a catheter.

3. The dimensionally stable polymer balloon of claim 1, wherein said micro-composite material comprises about 0.1 wt-% to about 20 wt-% of said fibril component. 4. The dimensionally stable polymer balloon of claim 1, wherein said micro-composite material comprises about 0.5 wt-% to about 8 wt-% of said fibril component.

5. The dimensionally stable polymer balloon of claim 1, wherein said micro-composite material comprises about 0.5 wt-% to about 15 wt-% of said fibril component. 6. The dimensionally stable balloon of claim 1, wherein said micro-composite material comprises about 50 wt-% to about 99.9 wt-% of said polymer matrix component.

7. The dimensionally stable balloon of claim 1, wherein said micro-composite material comprises about 85 wt-% to about 99.5 wt-% of said polymer matrix component.

8. The dimensionally stable balloon of claim 1, wherein the micro-composite material further comprises a compatibilizer component.

9. The dimensionally stable balloon of claim 8 wherein said compatibilizer is a block copolymer.

10. The dimensionally stable balloon of Claim 8 wherein said compatibilizer is selected from the group consisting of copolyester elastomers, ethylene unsaturated ester copolymers, copolymers of ethylene and a carboxylic acid or derivative thereof, polyolefins or ethylene-unsaturated ester copolymers grafted with functional monomers, copolymers of ethylene and a carboxylic acid or derivative thereof, terpolymers of ethylene, copolymers of unsaturated esters and carboxylic acids or derivatives thereof, maleic acid grafted styrene/ethylene-butadiene-

styrene block copolymers, acrylic elastomers, glycidyl(meth)acrylates, ionomeric copolymers, polyester-polyether block copolymers, and mixtures thereof.

11. The dimensionally stable polymer balloon of claim 1, wherein said compatibilizer is selected from the group consisting of ethylene-maleic anhydride copolymers, ethylene-methyl acrylate copolymers, ethylene-methyl acrylate-maleic anhydride terpolymers, ethylene- methyl acrylate-methacrylic acid terpolymers, alkyl(meth)acrylate-ethylene-glycidyl(meth)acrylate terpolymers, and mixtures thereof.

12. The dimensionally stable balloon of claim 1, wherein the fibril component is composed of rigid-rod thermoplastic material.

13. The dimensionally stable balloon of claim 1, wherein the fibril component is composed of semi-rigid-rod thermoplastic material.

14. The dimensionally stable balloon of claim 1, wherein the fibril component is composed of liquid crystal polymer material.

15. The dimensionally stable balloon of claim 1, wherein the fibril component has a melting point of about 275° C or less.

16. The dimensionally stable balloon of claim 1, wherein the fibril component has a melting point of about 250° C or less.

17. The dimensionally stable balloon of claim 1, wherein the fibril component has a melting point of about 150° to about 249° C.

18. The dimensionally stable balloon of claim 1, wherein the fibril component has a melting point of about 230° C or less.

19. The dimensionally stable balloon of claim 1, wherein the matrix component comprises a semi-compliant thermoplastic polymer.

20. The dimensionally stable balloon of claim 1, wherein the matrix component has a melting point of about 140° C to about 265° C.

21. The dimensionally stable polymer balloon of claim 1, wherein the matrix component comprises a polyamide-polyester block copolymer, a polyamide/polyether/polyester block copolymer, a polyester-polyether block copolymer, or a mixture thereof.

22. The dimensionally stable polymer balloon of claim 1, wherein the matrix component has a melting point of about 150° C to about 230° C.

23. The dimensionally stable polymer balloon of claim 1, wherein the matrix component has a melting point of about 220° or less.

24. The dimensionally stable balloon of claim 1, wherein the micro-fibers are oriented substantially parallel to the longitudinal axis of the balloon.

25. The dimensionally stable balloon of claim 1, wherein the micro-fibers are oriented diagonally to the longitudinal axis of the balloon.

26. The dimensionally stable balloon of claim 1, wherein the orientation of the micro-fibers relative to the longitudinal axis of the balloon changes through the balloon material in a direction transverse to said longitudinal axis.

31. (Amended) An inflatable medical balloon having a circumference and a longitudinal axis comprising:

a matrix material, said matrix material characterized as being semi-compliant; and having a plurality of individual fiber cores mixed therethrough, said cores being evenly distributed about the circumference of the balloon and being composed of one or more materials which are characterized as being stronger than the matrix material and having a bulk elongation less than the matrix material when the one or more materials are oriented in the direction of the longitudinal axis, and the matrix material and the core material operatively adhering to one another.

33. The medical balloon of claim 31, wherein the balloon longitudinally expands less than 5% beyond the pre-inflation state.

36. The medical balloon of claim 31, wherein the balloon has a multilayer structure.

Appendix B

1. Ticona Vectra A950
2. Solvay Advanced Polymers Xydar G-930 Liquid Crystal
3. Ticona Vectra C550 Liquid Crystal Polymer (LCP), 50% Mine
4. Ticona Vectra B230 Liquid Crystal Polymer (LCP), 30% Carbon
5. Ticona Vectra A700 Liquid Crystal Polymer (LCP), 30% Glass
6. Ticona Vectra A625 Liquid Crystal Polymer (LCP), 25% Grapl
7. Ticona Vectra A540 Liquid Crystal Polymer (LCP), 40% Mine
8. Ticona Vectra A530 Liquid Crystal Polymer (LCP), 30% Mine
9. Ticona Vectra A515 Liquid Crystal Polymer (LCP), 15% Mine
10. Ticona Vectra A440 Liquid Crystal Polymer (LCP), Glass/PT
11. Ticona Vectra A435 Liquid Crystal Polymer (LCP), Glass/PT
12. Ticona Vectra A430 Liquid Crystal Polymer (LCP), LCP/PTF
13. Ticona Vectra A422 Liquid Crystal Polymer (LCP), Glass/Grap
14. Ticona Vectra A420 Liquid Crystal Polymer (LCP), Glass/Mineral
15. Ticona Vectra A410 Liquid Crystal Polymer (LCP), 25% Glass/25%
16. Ticona Vectra A230 Liquid Crystal Polymer (LCP), 30% Carbon Fil
17. Ticona Vectra V140 Liquid Crystal Polymer (LCP), 40% Glass
18. Ticona Vectra L130 Liquid Crystal Polymer (LCP), 30% Glass
19. Ticona Vectra K140 Liquid Crystal Polymer (LCP), 40% Glass
20. Ticona Vectra K130 Liquid Crystal Polymer (LCP), 30% Glass
21. Ticona Vectra E130i Liquid Crystal Polymer (LCP), 30% Glass

22. Ticona Vectra C150 Liquid Crystal Polymer (LCP), 50% Glass

23. Ticona Vectra C130 Liquid Crystal Polymer (LCP), 30% Glass

24. Ticona Vectra C115 Liquid Crystal Polymer (LCP), 15% Glass

25. Ticona Vectra B130 Liquid Crystal Polymer (LCP), 30% Glass

26. Ticona Vectra A150 Liquid Crystal Polymer (LCP), 50% Glass

27. Ticona Vectra A130 Liquid Crystal Polymer (LCP), 30% Glass

28. Ticona Vectra A115 Liquid Crystal Polymer (LCP), 15% Glass

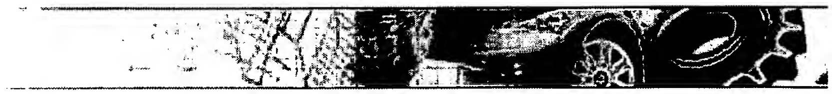
29. Ticona General Products List

30. US 5,834,560 – Baird et al

31. Vectran HS LCP Fiber

32. Vectran M LCP Fiber

Ticona



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ISO AST

VECTRA® A950

Base resin having a melt point of 280°C. Suitable for extrusion into film, sheet, and fibers. I
recommended for injection molding.

Property	Method	Value	Ur
Physical Properties			
Density	ISO 1183	1400	kg/
Mold shrinkage - parallel	ISO 294-4	0.0	
Mold shrinkage - normal	ISO 294-4	0.7	
Humidity absorption (23°C/50%RH)	ISO 62	0.03	
Mechanical Properties			
Tensile modulus (1mm/min)	ISO 527-2/1A	10600	M
Tensile stress at break (5mm/min)	ISO 527-2/1A	182	M
Tensile strain at break (5mm/min)	ISO 527-2/1A	3.4	
Tensile creep modulus 1h	ISO 899-1	9000	M
Tensile creep modulus 1000h	ISO 899-1	6600	M
Flexural modulus (23°C)	ISO 178	9100	M
Flexural strength (23°C)	ISO 178	158	M
Charpy impact strength @ 23C	ISO 179/1eU	267	KJ/
Charpy notched impact strength @ 23°C	ISO 179/1eA	95	KJ/
Unnotched impact str (Izod) @ 23°C	ISO 180/1U	252	KJ/
Notched impact strength (Izod) @ 23°C	ISO 180/1A	95	KJ/
Thermal Properties			
Melting temperature (10 C/min)	ISO 11357-1,-2,-3	280	°
DTUL @ 1.8 MPa	ISO 75-1, -2	187	°
DTUL @ 8.0 MPa	ISO 75-1, -2	94	°
Vicat softening temperature B50 (50C/h 50N)	ISO 306	145	°
Coeff. of linear therm expansion (parallel)	ISO 11359-2	0.04	E-
Coeff. of linear therm expansion (normal)	ISO 11359-2	0.38	E-
Flammability at thickness h	UL94	V-0	Cl
Electrical Properties			
Relative permittivity - 100Hz	IEC 60250	3.2	

Relative permittivity - 1MHz	IEC 60250	3.0	
Dissipation factor - 100Hz	IEC 60250	159	E
Dissipation factor - 1MHz	IEC 60250	200	E
Volume resistivity	IEC 60093	1E13	ohr
Surface resistivity	IEC 60093	1E14	ol
Electric strength	IEC 60243-1	47	KV/
Comparative tracking index CTI	IEC 60112	150	

Test Specimen Production

Injection molding mold temperature	ISO 294	60-120	°

Processing Conditions:

Parameter	Range	Units
Rear temperature	518-536 (270-280)	°F (°C
Center temperature	536-554 (280-290)	°F (°C
Front temperature	545-563 (285-295)	°F (°C
Nozzle temperature	554-572 (290-300)	°F (°C
Melt temperature	545-563 (285-295)	°F (°C
Mold temperature	176-248 (80-120)	°F (°C

Regrind:

25%

Additional Grade Information: expand all

Grade Literature List:

View all available literature for the selected grade. expand to view

Product Literature List:

View all available literature for the product. expand to view

Material Safety Data Sheets:

View all available MSDSs for the selected grade. expand to view

Underwriter's Laboratory (UL) Yellow Cards:

View all available UL yellow cards for the selected grade. expand to view

particular product or use.

To the best of our knowledge, the information contained in this publication is accurate; however, we do not assume whatsoever for the accuracy and completeness of such information. It is the sole responsibility of the users to inve: whether any existing patents are infringed by the use of the materials mentioned in this publication.

Moreover, there is a need to reduce human exposure to many materials to the lowest practical limits in view of pos adverse effects. To the extent that any hazards may have been mentioned in this publication, we neither suggest r guarantee that such hazards are the only ones which exist. We recommend that persons intending to rely on such recommendation or use any equipment, processing technique, or material mentioned in this publication should sati themselves that they can meet all applicable safety and health standards.

We strongly recommend that users seek and adhere to the manufacturer's or supplier's current instructions for har material they use. Please consult the nearest Ticona Sales Office, or call the telephone numbers listed above for a technical information. Call Customer Services for the appropriate Materials Safety Data Sheets (MSDS) before atte process these products.

Product is not intended for use in medical or dental implants.

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Solvay Advanced Polymers Xydar® G-930 Liquid Crystal P(

Subcategory: Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Close Analogs: This product line was acquired by Solvay Advanced Polymers from BP Amoco in November 200

Key Words: LCP

Material Notes:

Data provided by the manufacturer, Amoco Corporation.

This injection-moldable LCP offers the highest heat deflection temperature of any engineering thermoplastics. Din microwave transparency, excellent chemical resistance and is inherently UL94 V-0.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.6 g/cc	0.0578 lb/in³
Water Absorption	Max 0.1 %	Max 0.1 %
Mechanical Properties		
Tensile Strength, Yield	135 MPa	19600 psi
Elongation at Break	1.6 %	1.6 %
Tensile Modulus	18.6 GPa	2700 ksi
Flexural Modulus	13.4 GPa	1940 ksi
Flexural Yield Strength	172 MPa	24900 psi
Izod Impact, Notched	1 J/cm	1.87 ft-lb/in
Electrical Properties		
Dielectric Constant	4.2	4.2
Dielectric Constant, Low Frequency	4.2	4.2
Dissipation Factor	0.013	0.013

Dissipation Factor, Low Frequency	0.013	0.013	

Thermal Properties

CTE, linear 20°C	12 µm/m-°C	6.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	20 µm/m-°C	11.1 µin/in-°F	
Maximum Service Temperature, Air	220 °C	428 °F	UL Relative Thermal Index, Electric impact 200°C (400°F); Mechan
Deflection Temperature at 1.8 MPa (264 psi)	271 °C	520 °F	
UL RTI, Electrical	220 °C	428 °F	
UL RTI, Mechanical with Impact	200 °C	392 °F	
UL RTI, Mechanical without Impact	220 °C	428 °F	
Flammability, UL94	V-0	V-0	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® C550 Liquid Crystal Polymer (LCP), 50% Mine

Printer friendly version

Download to Excel (requires Excel and Windows)

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.89 g/cc	0.0683 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0.003 cm/cm	0.003 in/in
Linear Mold Shrinkage, Transverse	0.004 cm/cm	0.004 in/in
Mechanical Properties		
Tensile Strength, Ultimate	115 MPa	16700 psi
Elongation at Break	2.4 %	2.4 %
Tensile Modulus	19 GPa	2760 ksi
Flexural Modulus	17 GPa	2470 ksi
Flexural Yield Strength	170 MPa	24700 psi
Compressive Yield Strength	95 MPa	13800 psi
Charpy Impact, Notched	0.4 J/cm²	1.9 ft-lb/in²
Tensile Impact Strength	50 kJ/m²	23.8 ft-lb/in²
Compressive Modulus	16.5 GPa	2390 ksi
Izod Impact, Notched (ISO)	5 kJ/m²	2.38 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm

Surface Resistance	1e+016 ohm	1e+016 ohm	
Dielectric Constant	3.7	3.7	
Dielectric Constant, Low Frequency	4	4	
Dissipation Factor	0.007	0.007	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	183 sec	183 sec	
Comparative Tracking Index	225 V	225 V	

Thermal Properties

CTE, linear 20°C	1 µm/m-°C	0.556 µin/in-°F	
CTE, linear 20°C Transverse to Flow	60 µm/m-°C	33.3 µin/in-°F	
CTE, linear 100°C	1 µm/m-°C	0.556 µin/in-°F	Flow
CTE, linear 100°C	60 µm/m-°C	33.3 µin/in-°F	Transverse
Melting Point	325 °C	617 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	225 °C	437 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	

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Ticona Vectra® B230 Liquid Crystal Polymer (LCP), 30% Carbon Fil

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	**Metric**	**English**
Density	1.5 g/cc	0.0542 lb/in³
Water Absorption	0.03 %	0.03 %
Moisture Absorption at Equilibrium	0.03 %	0.03 %
Linear Mold Shrinkage	0 cm/cm	0 in/in
Linear Mold Shrinkage, Transverse	0 cm/cm	0 in/in
Mechanical Properties		
Hardness, Rockwell M	99	99
Tensile Strength, Ultimate	190 MPa	27600 psi
Elongation at Break	0.7 %	0.7 %
Tensile Modulus	30 GPa	4350 ksi
Flexural Modulus	25.5 GPa	3700 ksi
Flexural Yield Strength	320 MPa	46400 psi
Compressive Yield Strength	204 MPa	29600 psi
Charpy Impact, Notched	0.9 J/cm²	4.28 ft-lb/in²
Tensile Impact Strength	40 kJ/m²	19 ft-lb/in²
Compressive Modulus	33 GPa	4790 ksi
Izod Impact, Notched (ISO)	9 kJ/m²	4.28 ft-lb/in²

Electrical Properties

Electrical Resistivity	0.1 ohm-cm	0.1 ohm-cm	

Thermal Properties

CTE, linear 20°C	0 µm/m-°C	0 µin/in-°F	
CTE, linear 20°C Transverse to Flow	45 µm/m-°C	25 µin/in-°F	
CTE, linear 100°C	0 µm/m-°C	0 µin/in-°F	Flow
CTE, linear 100°C	45 µm/m-°C	25 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	235 °C	455 °F	
UL RTI, Electrical	130 °C		

Ticona Vectra® A700 Liquid Crystal Polymer (LCP), 30% Glass I

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.63 g/cc	0.0589 lb/in³
Mechanical Properties		
Tensile Strength, Ultimate	140 MPa	20300 psi
Elongation at Break	1.5 %	1.5 %
Tensile Modulus	14 GPa	2030 ksi
Flexural Modulus	14.4 GPa	2090 ksi
Flexural Yield Strength	230 MPa	33400 psi
Compressive Yield Strength	100 MPa	14500 psi
Charpy Impact, Notched	1.5 J/cm²	7.14 ft-lb/in²
Compressive Modulus	14.5 GPa	2100 ksi
Izod Impact, Notched (ISO)	12 kJ/m²	5.71 ft-lb/in²
Electrical Properties		
Electrical Resistivity	10000 ohm-cm	10000 ohm-cm
Surface Resistance	1e+010 ohm	1e+010 ohm
Comparative Tracking Index	175 V	175 V
Thermal Properties		

CTE, linear 20°C	9 µm/m-°C	5 µin/in-°F	
CTE, linear 20°C Transverse to Flow	60 µm/m-°C	33.3 µin/in-°F	
CTE, linear 100°C	60 µm/m-°C	33.3 µin/in-°F	Transverse
CTE, linear 100°C	9 µm/m-°C	5 µin/in-°F	Flow
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	225 °C	437 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A625 Liquid Crystal Polymer (LCP), 25% Grapl

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.54 g/cc	0.0556 lb/in³
Water Absorption	0.03 %	0.03 %
Moisture Absorption at Equilibrium	0.03 %	0.03 %
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in
Linear Mold Shrinkage, Transverse	0.003 cm/cm	0.003 in/in
Mechanical Properties		
Hardness, Rockwell M	62	62
Tensile Strength, Ultimate	140 MPa	20300 psi
Elongation at Break	5.7 %	5.7 %
Tensile Modulus	10 GPa	1450 ksi
Flexural Modulus	10 GPa	1450 ksi
Flexural Yield Strength	140 MPa	20300 psi
Compressive Yield Strength	56 MPa	8120 psi
Charpy Impact, Notched	1.5 J/cm²	7.14 ft-lb/in²
Tensile Impact Strength	80 kJ/m²	38.1 ft-lb/in²
Compressive Modulus	9 GPa	1310 ksi
Coefficient of Friction	0.15	0.15
Izod Impact, Notched (ISO)	22 kJ/m²	10.5 ft-lb/in²

Electrical Properties

Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm	
Surface Resistance	1e+015 ohm	1e+015 ohm	
Dielectric Constant	10	10	
Dielectric Constant, Low Frequency	25	25	
Dissipation Factor	0.14	0.14	
Dissipation Factor, Low Frequency	0.17	0.17	
Comparative Tracking Index	200 V	200 V	

Thermal Properties

CTE, linear 20°C	10 µm/m-°C	5.56 µin/in-°F	
CTE, linear 20°C Transverse to Flow	50 µm/m-°C	27.8 µin/in-°F	
CTE, linear 100°C	10 µm/m-°C	5.56 µin/in-°F	Flow
CTE, linear 100°C	50 µm/m-°C	27.8 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	185 °C	365 °F	
Vicat Softening Point	227 °C	441 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We adv
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Ticona Vectra® A540 Liquid Crystal Polymer (LCP), 40% Mine

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.76 g/cc	0.0636 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0.002 cm/cm	0.002 in/in
Linear Mold Shrinkage, Transverse	0.004 cm/cm	0.004 in/in
Mechanical Properties		
Hardness, Rockwell M	63	63
Tensile Strength, Ultimate	155 MPa	22500 psi
Elongation at Break	3.9 %	3.9 %
Tensile Modulus	19 GPa	2760 ksi
Flexural Modulus	16 GPa	2320 ksi
Flexural Yield Strength	195 MPa	28300 psi
Compressive Yield Strength	78 MPa	11300 psi
Charpy Impact, Notched	4 J/cm²	19 ft-lb/in²
Tensile Impact Strength	40 kJ/m²	19 ft-lb/in²
Compressive Modulus	12 GPa	1740 ksi
Coefficient of Friction	0.12	0.12
Izod Impact, Notched (ISO)	20 kJ/m²	9.52 ft-lb/in²

Electrical Properties

Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm	
Surface Resistance	1e+016 ohm	1e+016 ohm	
Dielectric Constant	3.7	3.7	
Dielectric Constant, Low Frequency	4.2	4.2	
Dissipation Factor	0.008	0.008	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	180 sec	180 sec	
Comparative Tracking Index	200 V	200 V	

Thermal Properties

CTE, linear 20°C	0 µm/m-°C	0 µin/in-°F	
CTE, linear 20°C Transverse to Flow	50 µm/m-°C	27.8 µin/in-°F	
CTE, linear 100°C	0 µm/m-°C	0 µin/in-°F	Flow
CTE, linear 100°C	50 µm/m-°C	27.8 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	200 °C	392 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A530 Liquid Crystal Polymer (LCP), 30% Mine

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.65 g/cc	0.0596 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0.002 cm/cm	0.002 in/in
Linear Mold Shrinkage, Transverse	0.004 cm/cm	0.004 in/in
Mechanical Properties		
Tensile Strength, Ultimate	175 MPa	25400 psi
Elongation at Break	5.5 %	5.5 %
Tensile Modulus	14 GPa	2030 ksi
Flexural Modulus	11 GPa	1600 ksi
Flexural Yield Strength	175 MPa	25400 psi
Compressive Yield Strength	60 MPa	8700 psi
Charpy Impact, Notched	0.4 J/cm²	1.9 ft-lb/in²
Compressive Modulus	10 GPa	1450 ksi
Izod Impact, Notched (ISO)	45 kJ/m²	21.4 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm

Dielectric Constant	3.3	3.3	
Dielectric Constant, Low Frequency	3.7	3.7	
Dissipation Factor	0.008	0.008	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	180 sec	180 sec	
Comparative Tracking Index	200 V	200 V	

Thermal Properties

CTE, linear 20°C	12 µm/m-°C	6.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	69 µm/m-°C	38.3 µin/in-°F	
CTE, linear 100°C	12 µm/m-°C	6.67 µin/in-°F	Flow
CTE, linear 100°C	69 µm/m-°C	38.3 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	185 °C	365 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A515 Liquid Crystal Polymer (LCP), 15% Mine

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.52 g/cc	0.0549 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0.003 cm/cm	0.003 in/in
Linear Mold Shrinkage, Transverse	0.004 cm/cm	0.004 in/in
Mechanical Properties		
Hardness, Rockwell M	63	63
Tensile Strength, Ultimate	175 MPa	25400 psi
Elongation at Break	4.6 %	4.6 %
Tensile Modulus	14 GPa	2030 ksi
Flexural Modulus	11 GPa	1600 ksi
Flexural Yield Strength	170 MPa	24700 psi
Compressive Yield Strength	61 MPa	8850 psi
Charpy Impact, Notched	2.1 J/cm²	9.99 ft-lb/in²
Tensile Impact Strength	80 kJ/m²	38.1 ft-lb/in²
Compressive Modulus	10 GPa	1450 ksi
Coefficient of Friction	0.19	0.19
Izod Impact, Notched (ISO)	60 kJ/m²	28.6 ft-lb/in²

Electrical Properties

Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm	
Surface Resistance	1e+017 ohm	1e+017 ohm	
Dielectric Constant	3.1	3.1	
Dielectric Constant, Low Frequency	3.6	3.6	
Dissipation Factor	0.009	0.009	
Dissipation Factor, Low Frequency	0.03	0.03	
Arc Resistance	145 sec	145 sec	
Comparative Tracking Index	175 V	175 V	

Thermal Properties

CTE, linear 20°C	-10 µm/m-°C	-5.56 µin/in-°F	
CTE, linear 20°C Transverse to Flow	64 µm/m-°C	35.6 µin/in-°F	
CTE, linear 100°C	-10 µm/m-°C	-5.56 µin/in-°F	Flow
CTE, linear 100°C	64 µm/m-°C	35.6 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	185 °C	365 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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Vectran HS LCP Fiber

Subcategory: Composite Fibers; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Material Notes:
Description: Vectran is a high-performance thermoplastic multifilament yarn spun from Vectran ® liquid crystal p commercially available melt spun LCP fiber in the world. Vectran fiber exhibits exceptional strength and rigidity. P five times stronger than steel and ten times stronger than aluminum. These properties characterize Vectran: High creep resistance, high abrasion resistance, excellent flex/fold characteristics, minimal moisture absorption , excell coefficient of thermal expansion (CTE), high dielectric strength, outstanding cut resistance, excellent property rete outstanding vibration damping characteristics, high impact resistance.

Applications: Ropes and cables, electronics, recreations, aerospace, composites, military, industrial

Chemical Resistance: Hydrolytically stable. Resistant to organic solvents. Stable to acids (<90% conc.). Stable t

Data provided by Celanese Acetate LLC.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English	
Density	1.4 g/cc	0.0506 lb/in³	
Moisture Absorption at Equilibrium	Max 0.1 %	Max 0.1 %	
Mechanical Properties			
Tensile Strength, Ultimate	2840 - 3210 MPa	412000 - 465000 psi	10 in. gauge length, 10% str
Elongation at Break	3.3 - 3.7 %	3.3 - 3.7 %	10 in. gauge length, 10% str
Tensile Modulus	64.8 - 72.4 GPa	9400 - 10500 ksi	10 in. gauge length, 10% str
Electrical Properties			
Dielectric Constant	3.3	3.3	at
Thermal Properties			
Melting Point	330 °C	626 °F	

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Vectran M LCP Fiber

Subcategory: Composite Fibers; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Material Notes:
D scription: Vectran is a high-performance thermoplastic multifilament yarn spun from Vectran ® liquid crystal p
commercially available melt spun LCP fiber in the world. Vectran fiber exhibits exceptional strength and rigidity. P
five times stronger than steel and ten times stronger than aluminum. These properties characterize Vectran: High
creep resistance, high abrasion resistance, excellent flex/fold characteristics, minimal moisture absorption , excell
coefficient of thermal expansion (CTE), high dielectric strength, outstanding cut resistance, excellent property rete
outstanding vibration damping characteristics, high impact resistance.

Applications: Ropes and cables, electronics, recreations, aerospace, composites, military, industrial

Chemical Resistance: Hydrolytically stable. Resistant to organic solvents. Stable to acids (<90% conc.). Stable t

Data provided by Celanese Acetate LLC.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English	
Density	1.4 g/cc	0.0506 lb/in³	
Moisture Absorption at Equilibrium	Max 0.1 %	Max 0.1 %	
Mechanical Properties			
Tensile Strength, Ultimate	1110 MPa	161000 psi	10 in. gauge length, 10% str
Elongation at Break	2 %	2 %	10 in. gauge length, 10% str
Tensile Modulus	52.4 GPa	7600 ksi	10 in. gauge length, 10% str
Electrical Properties			
Dielectric Constant	3.3	3.3	at
Thermal Properties			
Melting Point	276 °C	529 °F	

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Ticona Vectra® A440 Liquid Crystal Polymer (LCP), Glass/PTI

Printer friendly version
Download to Excel (requires Excel and Windows)

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.65 g/cc	0.0596 lb/in³
Mechanical Properties		
Tensile Strength, Ultimate	180 MPa	26100 psi
Elongation at Break	2.6 %	2.6 %
Tensile Modulus	16 GPa	2320 ksi
Flexural Modulus	15 GPa	2180 ksi
Flexural Yield Strength	245 MPa	35500 psi
Compressive Yield Strength	110 MPa	16000 psi
Charpy Impact, Notched	3.7 J/cm²	17.6 ft-lb/in²
Compressive Modulus	15 GPa	2180 ksi
Izod Impact, Notched (ISO)	22 kJ/m²	10.5 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+016 ohm	1e+016 ohm
Dielectric Constant	3.4	3.4
Dielectric Constant, Low Frequency	3.7	3.7
Dissipation Factor	0.008	0.008
Dissipation Factor, Low Frequency	0.02	0.02

Arc Resistance	180 sec	180 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

Melting Point	280 °C	536 °F
Maximum Service Temperature, Air	130 °C	266 °F
Deflection Temperature at 1.8 MPa (264 psi)	230 °C	446 °F
UL RTI, Electrical	130 °C	266 °F
UL RTI, Mechanical with Impact	130 °C	266 °F
Flammability, UL94	V-0	V-0

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Ticona Vectra® A435 Liquid Crystal Polymer (LCP), Glass/PTI

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.62 g/cc	0.0585 lb/in³
Mechanical Properties		
Tensile Strength, Ultimate	175 MPa	25400 psi
Elongation at Break	3.3 %	3.3 %
Tensile Modulus	12 GPa	1740 ksi
Flexural Modulus	10 GPa	1450 ksi
Flexural Yield Strength	210 MPa	30500 psi
Compressive Yield Strength	77 MPa	11200 psi
Charpy Impact, Notched	4 J/cm²	19 ft-lb/in²
Compressive Modulus	10.5 GPa	1520 ksi
Coefficient of Friction	0.11	0.11
Izod Impact, Notched (ISO)	30 kJ/m²	14.3 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+016 ohm	1e+016 ohm
Dielectric Constant	2.8	2.8
Dielectric Constant, Low Frequency	3.2	3.2
Dissipation Factor	0.007	0.007

Dissipation Factor, Low Frequency	0.02	0.02	
Comparative Tracking Index	175 V	175 V	

Thermal Properties

CTE, linear 20°C	0 µm/m-°C	0 µin/in-°F	
CTE, linear 20°C Transverse to Flow	85 µm/m-°C	47.2 µin/in-°F	
CTE, linear 100°C	0 µm/m-°C	0 µin/in-°F	Flow
CTE, linear 100°C	85 µm/m-°C	47.2 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	230 °C	446 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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MatWeb presents MatWeb MATERIAL PROPERTY DATA

Ticona Vectra® A430 Liquid Crystal Polymer (LCP), LCP/PTF

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Subcategory: Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.5 g/cc	0.0542 lb/in³
Mechanical Properties		
Tensile Strength, Ultimate	175 MPa	25400 psi
Elongation at Break	6.2 %	6.2 %
Tensile Modulus	10 GPa	1450 ksi
Flexural Modulus	8 GPa	1160 ksi
Flexural Yield Strength	130 MPa	18900 psi
Compressive Yield Strength	38 MPa	5510 psi
Charpy Impact, Notched	NB	NB
Compressive Modulus	6 GPa	870 ksi
Coefficient of Friction	0.18	0.18
Izod Impact, Notched (ISO)	55 kJ/m²	26.2 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+015 ohm	1e+015 ohm
Dielectric Constant	2.9	2.9
Dielectric Constant, Low Frequency	3.2	3.2
Dissipation Factor	0.008	0.008

Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	130 sec	130 sec	
Comparative Tracking Index	225 V	225 V	

Thermal Prop rties

CTE, linear 20°C	-10 µm/m-°C	-5.56 µin/in-°F	
CTE, linear 20°C Transverse to Flow	100 µm/m-°C	55.6 µin/in-°F	
CTE, linear 100°C	-10 µm/m-°C	-5.56 µin/in-°F	Flow
CTE, linear 100°C	100 µm/m-°C	55.6 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	165 °C	329 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

Ticona Vectra® A422 Liquid Crystal Polymer (LCP), Glass/Grap

Printer friendly version
Download to Excel (requires Excel and Windows)

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.68 g/cc	0.0607 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in
Linear Mold Shrinkage, Transverse	0.003 cm/cm	0.003 in/in
Mechanical Properties		
Tensile Strength, Ultimate	180 MPa	26100 psi
Elongation at Break	2.3 %	2.3 %
Tensile Modulus	20 GPa	2900 ksi
Flexural Modulus	16.5 GPa	2390 ksi
Flexural Yield Strength	250 MPa	36300 psi
Compressive Yield Strength	120 MPa	17400 psi
Charpy Impact, Notched	2.1 J/cm²	9.99 ft-lb/in²
Compressive Modulus	18.5 GPa	2680 ksi
Coefficient of Friction	0.18	0.18
Izod Impact, Notched (ISO)	22 kJ/m²	10.5 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm

Surface Resistance	1e+015 ohm	1e+015 ohm	
Dielectric Constant	6.2	6.2	
Dielectric Constant, Low Frequency	7.4	7.4	
Dissipation Factor	0.02	0.02	
Dissipation Factor, Low Frequency	0.03	0.03	
Arc Resistance	125 sec	125 sec	
Comparative Tracking Index	225 V	225 V	

Thermal Properties

CTE, linear 20°C	3 µm/m-°C	1.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	58 µm/m-°C	32.2 µin/in-°F	
CTE, linear 100°C	3 µm/m-°C	1.67 µin/in-°F	Flow
CTE, linear 100°C	58 µm/m-°C	32.2 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	230 °C	446 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A420 Liquid Crystal Polymer (LCP), Glass/Mineral/(

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	**Metric**	**English**
Density	1.89 g/cc	0.0683 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Hardness, Rockwell M	79	79
Tensile Strength, Ultimate	145 MPa	21000 psi
Elongation at Break	1.4 %	1.4 %
Tensile Modulus	22 GPa	3190 ksi
Flexural Modulus	20 GPa	2900 ksi
Flexural Yield Strength	200 MPa	29000 psi
Compressive Yield Strength	131 MPa	19000 psi
Charpy Impact, Notched	0.8 J/cm²	3.81 ft-lb/in²
Compressive Modulus	21.5 GPa	3120 ksi
Coefficient of Friction	0.17	0.17
Izod Impact, Notched (ISO)	6 kJ/m²	2.86 ft-lb/in²

Electrical Properties

Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm	
Surface Resistance	1e+016 ohm	1e+016 ohm	
Dielectric Constant	5.9	5.9	
Dielectric Constant, Low Frequency	6.7	6.7	
Dissipation Factor	0.02	0.02	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	180 sec	180 sec	
Comparative Tracking Index	250 V	250 V	

Thermal Properties

CTE, linear 20°C	11 µm/m-°C	6.11 µin/in-°F	
CTE, linear 20°C Transverse to Flow	51 µm/m-°C	28.3 µin/in-°F	
CTE, linear 100°C	11 µm/m-°C	6.11 µin/in-°F	Flov
CTE, linear 100°C	51 µm/m-°C	28.3 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	230 °C	446 °F	
Vicat Softening Point	238 °C	460 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A410 Liquid Crystal Polymer (LCP), 25% Glass/25%

Printer friendly version
Download to Excel (requires Excel and Windows)

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.84 g/cc	0.0665 lb/in³
Water Absorption	0.04 %	0.04 %
Moisture Absorption at Equilibrium	0.04 %	0.04 %
Linear Mold Shrinkage	0.002 cm/cm	0.002 in/in
Linear Mold Shrinkage, Transverse	0.003 cm/cm	0.003 in/in
Mechanical Properties		
Hardness, Rockwell M	76	76
Tensile Strength, Ultimate	150 MPa	21800 psi
Elongation at Break	2 %	2 %
Tensile Modulus	20 GPa	2900 ksi
Flexural Modulus	18 GPa	2610 ksi
Flexural Yield Strength	220 MPa	31900 psi
Compressive Yield Strength	116 MPa	16800 psi
Charpy Impact, Notched	0.8 J/cm²	3.81 ft-lb/in²
Compressive Modulus	19 GPa	2760 ksi
Coefficient of Friction	0.21	0.21
Izod Impact, Notched (ISO)	12 kJ/m²	5.71 ft-lb/in²

Electrical Properties

Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm	
Surface Resistance	1e+016 ohm	1e+016 ohm	
Dielectric Constant	3.9	3.9	
Dielectric Constant, Low Frequency	4.4	4.4	
Dissipation Factor	0.007	0.007	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	180 sec	180 sec	
Comparative Tracking Index	175 V	175 V	

Thermal Properties

CTE, linear 20°C	5 µm/m-°C	2.78 µin/in-°F	
CTE, linear 20°C Transverse to Flow	66 µm/m-°C	36.7 µin/in-°F	
CTE, linear 100°C	5 µm/m-°C	2.78 µin/in-°F	Flow
CTE, linear 100°C	66 µm/m-°C	36.7 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	235 °C	455 °F	
Vicat Softening Point	235 °C	455 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A230 Liquid Crystal Polymer (LCP), 30% Carbon Fil

Printer friendly version
Download to Excel (requires Excel and Windows)

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.49 g/cc	0.0538 lb/in³
Water Absorption	0.03 %	0.03 %
Moisture Absorption at Equilibrium	0.03 %	0.03 %
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Hardness, Rockwell M	83	83
Tensile Strength, Ultimate	125 MPa	18100 psi
Elongation at Break	0.8 %	0.8 %
Tensile Modulus	24.5 GPa	3550 ksi
Flexural Modulus	23 GPa	3340 ksi
Flexural Yield Strength	220 MPa	31900 psi
Compressive Yield Strength	136 MPa	19700 psi
Charpy Impact, Notched	1.5 J/cm²	7.14 ft-lb/in²
Tensile Impact Strength	60 kJ/m²	28.6 ft-lb/in²
Compressive Modulus	23.5 GPa	3410 ksi
Coefficient of Friction	0.12	0.12
Izod Impact, Notched (ISO)	15 kJ/m²	7.14 ft-lb/in²

Electrical Properties

Electrical Resistivity	0.1 ohm-cm	0.1 ohm-cm	

Thermal Properties

CTE, linear 20°C	-8 µm/m-°C	-4.44 µin/in-°F	
CTE, linear 20°C Transverse to Flow	58 µm/m-°C	32.2 µin/in-°F	
CTE, linear 100°C	-8 µm/m-°C	-4.44 µin/in-°F	Flow
CTE, linear 100°C	58 µm/m-°C	32.2 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	225 °C	437 °F	
Vicat Softening Point	232 °C	450 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® V140 Liquid Crystal Polymer (LCP), 40% Glass I

Printer friendly version
Download to Excel (requires Excel and Windows)

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.67 g/cc	0.0603 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0.002 cm/cm	0.002 in/in
Linear Mold Shrinkage, Transverse	0.004 cm/cm	0.004 in/in
M chanical Properties		
Tensile Strength, Ultimate	130 MPa	18900 psi
Elongation at Break	1 %	1 %
Tensile Modulus	18 GPa	2610 ksi
Flexural Modulus	16 GPa	2320 ksi
Flexural Yield Strength	210 MPa	30500 psi
Compressive Yield Strength	134 MPa	19400 psi
Charpy Impact, Notched	1.1 J/cm²	5.24 ft-lb/in²
Compressive Modulus	16 GPa	2320 ksi
Izod Impact, Notched (ISO)	7 kJ/m²	3.33 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm

Dielectric Constant	3.7	3.7	
Dielectric Constant, Low Frequency	3.8	3.8	
Dissipation Factor	0.002	0.002	
Dissipation Factor, Low Frequency	0.007	0.007	
Arc Resistance	165 sec	165 sec	
Comparative Tracking Index	175 V	175 V	

Thermal Properties

CTE, linear 20°C	10 µm/m-°C	5.56 µin/in-°F	
CTE, linear 20°C Transverse to Flow	67 µm/m-°C	37.2 µin/in-°F	
CTE, linear 100°C	10 µm/m-°C	5.56 µin/in-°F	Flow
CTE, linear 100°C	67 µm/m-°C	37.2 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	270 °C	518 °F	[
Deflection Temperature at 1.8 MPa (264 psi)	270 °C	518 °F	
Flammability, UL94	V-0	V-0	

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistai for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We adv one of its raw conversions in your calculations to minimize rounding error. We also ask that you refer to MatWeb's disclaimer and terms of use regardir property values for this datasheet as they were originally entered into MatWeb.

Ticona Vectra® L130 Liquid Crystal Polymer (LCP), 30% Glass I

Printer friendly version
Download to Excel (requires Excel and Windows)

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

K y Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	**Metric**	**English**
Density	1.61 g/cc	0.0582 lb/in³
Water Absorption	0.04 %	0.04 %
Moisture Absorption at Equilibrium	0.04 %	0.04 %
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Tensile Strength, Ultimate	155 MPa	22500 psi
Elongation at Break	1.6 %	1.6 %
Tensile Modulus	15 GPa	2180 ksi
Flexural Modulus	16 GPa	2320 ksi
Flexural Yield Strength	230 MPa	33400 psi
Compressive Yield Strength	100 MPa	14500 psi
Charpy Impact, Notched	4.3 J/cm²	20.5 ft-lb/in²
Compressive Modulus	14 GPa	2030 ksi
Izod Impact, Notched (ISO)	23 kJ/m²	10.9 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm

Dielectric Constant	3.3	3.3	
Dielectric Constant, Low Frequency	3.8	3.8	
Dissipation Factor	0.02	0.02	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	130 sec	130 sec	
Comparative Tracking Index	175 V	175 V	

Thermal Properties

CTE, linear 20°C	5 µm/m-°C	2.78 µin/in-°F	
CTE, linear 20°C Transverse to Flow	65 µm/m-°C	36.1 µin/in-°F	
CTE, linear 100°C	5 µm/m-°C	2.78 µin/in-°F	Flow
CTE, linear 100°C	65 µm/m-°C	36.1 µin/in-°F	Transverse
Melting Point	302 °C	576 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	235 °C	455 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	45 %	45 %	

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Ticona Vectra® K140 Liquid Crystal Polymer (LCP), 40% Glass I

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.71 g/cc	0.0618 lb/in³
Water Absorption	0.04 %	0.04 %
Moisture Absorption at Equilibrium	0.04 %	0.04 %
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Tensile Strength, Ultimate	160 MPa	23200 psi
Elongation at Break	1.2 %	1.2 %
Tensile Modulus	20 GPa	2900 ksi
Flexural Modulus	18 GPa	2610 ksi
Flexural Yield Strength	245 MPa	35500 psi
Compressive Yield Strength	127 MPa	18400 psi
Charpy Impact, Notched	1.4 J/cm²	6.66 ft-lb/in²
Compressive Modulus	18 GPa	2610 ksi
Izod Impact, Notched (ISO)	14 kJ/m²	6.66 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm

Dielectric Constant	3.6	3.6	
Dielectric Constant, Low Frequency	4.1	4.1	
Dissipation Factor	0.01	0.01	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	140 sec	140 sec	
Comparative Tracking Index	175 V	175 V	

Thermal Properties

CTE, linear 20°C	3 µm/m-°C	1.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	79 µm/m-°C	43.9 µin/in-°F	
CTE, linear 100°C	3 µm/m-°C	1.67 µin/in-°F	Flow
CTE, linear 100°C	79 µm/m-°C	43.9 µin/in-°F	Transverse
Melting Point	320 °C	608 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	217 °C	423 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® K130 Liquid Crystal Polymer (LCP), 30% Glass I

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.61 g/cc	0.0582 lb/in³
Water Absorption	0.04 %	0.04 %
Moisture Absorption at Equilibrium	0.04 %	0.04 %
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Tensile Strength, Ultimate	165 MPa	23900 psi
Elongation at Break	1.3 %	1.3 %
Tensile Modulus	18 GPa	2610 ksi
Flexural Modulus	16 GPa	2320 ksi
Flexural Yield Strength	245 MPa	35500 psi
Compressive Yield Strength	111 MPa	16100 psi
Charpy Impact, Notched	1.8 J/cm²	8.57 ft-lb/in²
Compressive Modulus	15 GPa	2180 ksi
Izod Impact, Notched (ISO)	16 kJ/m²	7.61 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm

Dielectric Constant	3.4	3.4	
Dielectric Constant, Low Frequency	3.9	3.9	
Dissipation Factor	0.01	0.01	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	130 sec	130 sec	
Comparative Tracking Index	175 V	175 V	

Thermal Properties

CTE, linear 20°C	0 µm/m-°C	0 µin/in-°F	
CTE, linear 20°C Transverse to Flow	44 µm/m-°C	24.4 µin/in-°F	
CTE, linear 100°C	0 µm/m-°C	0 µin/in-°F	Flow
CTE, linear 100°C	44 µm/m-°C	24.4 µin/in-°F	Transverse
Melting Point	320 °C	608 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	215 °C	419 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	44 %	44 %	

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Ticona Vectra® E130i Liquid Crystal Polymer (LCP), 30% Glass

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.61 g/cc	0.0582 lb/in³
Water Absorption	0.04 %	0.04 %
Moisture Absorption at Equilibrium	0.04 %	0.04 %
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Tensile Strength, Ultimate	160 MPa	23200 psi
Elongation at Break	1.6 %	1.6 %
Tensile Modulus	17 GPa	2470 ksi
Flexural Modulus	16 GPa	2320 ksi
Flexural Yield Strength	230 MPa	33400 psi
Compressive Yield Strength	93 MPa	13500 psi
Charpy Impact, Notched	1.8 J/cm²	8.57 ft-lb/in²
Compressive Modulus	14 GPa	2030 ksi
Izod Impact, Notched (ISO)	26 kJ/m²	12.4 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm

Dielectric Constant	3.2	3.2	
Dielectric Constant, Low Frequency	3.5	3.5	
Dissipation Factor	0.02	0.02	
Dissipation Factor, Low Frequency	0.03	0.03	
Arc Resistance	140 sec	140 sec	
Comparative Tracking Index	200 V	200 V	

Thermal Properties

CTE, linear 20°C	1 µm/m-°C	0.556 µin/in-°F	
CTE, linear 20°C Transverse to Flow	73 µm/m-°C	40.6 µin/in-°F	
CTE, linear 100°C	1 µm/m-°C	0.556 µin/in-°F	Flow
CTE, linear 100°C	73 µm/m-°C	40.6 µin/in-°F	Transverse
Melting Point	335 °C	635 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	280 °C	536 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	44 %	44 %	

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Ticona Vectra® C150 Liquid Crystal Polymer (LCP), 50% Glass I

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	**Metric**	**English**
Density	1.81 g/cc	0.0654 lb/in³
Water Absorption	0.01 %	0.01 %
Moisture Absorption at Equilibrium	0.01 %	0.01 %
Linear Mold Shrinkage	0.002 cm/cm	0.002 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Tensile Strength, Ultimate	125 MPa	18100 psi
Elongation at Break	1 %	1 %
Tensile Modulus	24.5 GPa	3550 ksi
Flexural Modulus	20 GPa	2900 ksi
Flexural Yield Strength	205 MPa	29700 psi
Compressive Yield Strength	152 MPa	22000 psi
Charpy Impact, Notched	1.2 J/cm²	5.71 ft-lb/in²
Compressive Modulus	20.5 GPa	2970 ksi
Izod Impact, Notched (ISO)	10 kJ/m²	4.76 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm

Dielectric Constant	4	4	
Dielectric Constant, Low Frequency	4.5	4.5	
Dissipation Factor	0.009	0.009	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	182 sec	182 sec	
Comparative Tracking Index	250 V	250 V	

Thermal Properties

CTE, linear 20°C	2 µm/m-°C	1.11 µin/in-°F	
CTE, linear 20°C Transverse to Flow	64 µm/m-°C	35.6 µin/in-°F	
CTE, linear 100°C	2 µm/m-°C	1.11 µin/in-°F	Flow
CTE, linear 100°C	64 µm/m-°C	35.6 µin/in-°F	Transverse
Melting Point	325 °C	617 °F	
Maximum Service Temperature, Air	220 °C	428 °F	220/200°C
Deflection Temperature at 1.8 MPa (264 psi)	255 °C	491 °F	
UL RTI, Electrical	220 °C	428 °F	
UL RTI, Mechanical with Impact	200 °C	392 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® C130 Liquid Crystal Polymer (LCP), 30% Glass I

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please click here if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.62 g/cc	0.0585 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Tensile Strength, Ultimate	160 MPa	23200 psi
Elongation at Break	1.9 %	1.9 %
Tensile Modulus	15 GPa	2180 ksi
Flexural Modulus	14 GPa	2030 ksi
Flexural Yield Strength	245 MPa	35500 psi
Compressive Yield Strength	139 MPa	20200 psi
Charpy Impact, Notched	1.6 J/cm²	7.61 ft-lb/in²
Tensile Impact Strength	70 kJ/m²	33.3 ft-lb/in²
Compressive Modulus	22 GPa	3190 ksi
Izod Impact, Notched (ISO)	20 kJ/m²	9.52 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm

Surface Resistance	1e+016 ohm	1e+016 ohm	
Dielectric Constant	3.4	3.4	
Dielectric Constant, Low Frequency	3.8	3.8	
Dissipation Factor	0.009	0.009	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	182 sec	182 sec	
Comparative Tracking Index	200 V	200 V	

Thermal Properties

CTE, linear 20°C	3 µm/m-°C	1.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	58 µm/m-°C	32.2 µin/in-°F	
CTE, linear 100°C	3 µm/m-°C	1.67 µin/in-°F	Flow
CTE, linear 100°C	58 µm/m-°C	32.2 µin/in-°F	Transverse
Melting Point	325 °C	617 °F	
Maximum Service Temperature, Air	240 °C	464 °F	240/220°C (460/430°F)
Deflection Temperature at 0.46 MPa (66 psi)	284 °C	543 °F	
Deflection Temperature at 1.8 MPa (264 psi)	255 °C	491 °F	
Vicat Softening Point	252 °C	486 °F	
UL RTI, Electrical	240 °C	464 °F	
UL RTI, Mechanical with Impact	220 °C	428 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	44 %	44 %	

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for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We adv
one of its raw conversions in your calculations to minimize rounding error. We also ask that you refer to MatWeb's disclaimer and terms of use regardir
property values for this datasheet as they were originally entered into MatWeb.

Ticona Vectra® C115 Liquid Crystal Polymer (LCP), 15% Glass I

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.5 g/cc	0.0542 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0 cm/cm	0 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Tensile Strength, Ultimate	160 MPa	23200 psi
Elongation at Break	2.5 %	2.5 %
Tensile Modulus	14 GPa	2030 ksi
Flexural Modulus	12 GPa	1740 ksi
Flexural Yield Strength	200 MPa	29000 psi
Compressive Yield Strength	82 MPa	11900 psi
Charpy Impact, Notched	3 J/cm²	14.3 ft-lb/in²
Compressive Modulus	11 GPa	1600 ksi
Izod Impact, Notched (ISO)	30 kJ/m²	14.3 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm

Dielectric Constant	3.1	3.1	
Dielectric Constant, Low Frequency	3.4	3.4	
Dissipation Factor	0.01	0.01	
Dissipation Factor, Low Frequency	0.03	0.03	
Arc Resistance	135 sec	135 sec	
Comparative Tracking Index	150 V	150 V	

Thermal Properties

CTE, linear 20°C	-3 µm/m-°C	-1.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	66 µm/m-°C	36.7 µin/in-°F	
CTE, linear 100°C	-3 µm/m-°C	-1.67 µin/in-°F	Flow
CTE, linear 100°C	66 µm/m-°C	36.7 µin/in-°F	Transverse
Melting Point	325 °C	617 °F	
Maximum Service Temperature, Air	240 °C	464 °F	240/200°C (460/400°F)
Deflection Temperature at 1.8 MPa (264 psi)	245 °C	473 °F	
UL RTI, Electrical	240 °C	464 °F	
UL RTI, Mechanical with Impact	220 °C	428 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® B130 Liquid Crystal Polymer (LCP), 30% Glass I

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.6 g/cc	0.0578 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0 cm/cm	0 in/in
Linear Mold Shrinkage, Transverse	0.001 cm/cm	0.001 in/in
Mechanical Properties		
Tensile Strength, Ultimate	190 MPa	27600 psi
Elongation at Break	1 %	1 %
Tensile Modulus	20 GPa	2900 ksi
Flexural Modulus	17 GPa	2470 ksi
Flexural Yield Strength	300 MPa	43500 psi
Compressive Yield Strength	150 MPa	21800 psi
Charpy Impact, Notched	1.3 J/cm²	6.19 ft-lb/in²
Tensile Impact Strength	50 kJ/m²	23.8 ft-lb/in²
Compressive Modulus	21.5 GPa	3120 ksi
Izod Impact, Notched (ISO)	12 kJ/m²	5.71 ft-lb/in²
Electrical Properties		
Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm

Surface Resistance	1e+017 ohm	1e+017 ohm	
Dielectric Constant	3.5	3.5	
Dielectric Constant, Low Frequency	3.7	3.7	
Dissipation Factor	0.006	0.006	
Dissipation Factor, Low Frequency	0.01	0.01	
Arc Resistance	124 sec	124 sec	
Comparative Tracking Index	175 V	175 V	

Thermal Properties

CTE, linear 20°C	1 µm/m-°C	0.556 µin/in-°F	
CTE, linear 20°C Transverse to Flow	53 µm/m-°C	29.4 µin/in-°F	
CTE, linear 100°C	1 µm/m-°C	0.556 µin/in-°F	Flow
CTE, linear 100°C	53 µm/m-°C	29.4 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	130 °C	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	235 °C	455 °F	
Vicat Softening Point	243 °C	469 °F	
UL RTI, Electrical	130 °C	266 °F	
UL RTI, Mechanical with Impact	130 °C	266 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	51 %	51 %	

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Ticona Vectra® A150 Liquid Crystal Polymer (LCP), 50% Glass I

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.79 g/cc	0.0647 lb/in³
Water Absorption	0.01 %	0.01 %
Moisture Absorption at Equilibrium	0.01 %	0.01 %
Linear Mold Shrinkage	0.002 cm/cm	0.002 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Hardness, Rockwell M	93	93
Tensile Strength, Ultimate	160 MPa	23200 psi
Elongation at Break	1.3 %	1.3 %
Tensile Modulus	24.5 GPa	3550 ksi
Flexural Modulus	21 GPa	3050 ksi
Flexural Yield Strength	250 MPa	36300 psi
Compressive Yield Strength	140 MPa	20300 psi
Charpy Impact, Notched	1.2 J/cm²	5.71 ft-lb/in²
Tensile Impact Strength	50 kJ/m²	23.8 ft-lb/in²
Compressive Modulus	21 GPa	3050 ksi
Coefficient of Friction	0.19	0.19
Izod Impact, Notched (ISO)	12 kJ/m²	5.71 ft-lb/in²

Electrical Properties

Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm	
Surface Resistance	1e+016 ohm	1e+016 ohm	
Dielectric Constant	4	4	
Dielectric Constant, Low Frequency	4.5	4.5	
Dissipation Factor	0.008	0.008	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	180 sec	180 sec	
Comparative Tracking Index	175 V	175 V	

Thermal Properties

CTE, linear 20°C	3 µm/m-°C	1.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	64 µm/m-°C	35.6 µin/in-°F	
CTE, linear 100°C	3 µm/m-°C	1.67 µin/in-°F	Flow
CTE, linear 100°C	64 µm/m-°C	35.6 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	220 °C	428 °F	220/220°C
Deflection Temperature at 0.46 MPa (66 psi)	252 °C	486 °F	
Deflection Temperature at 1.8 MPa (264 psi)	240 °C	464 °F	
Vicat Softening Point	235 °C	455 °F	
UL RTI, Electrical	220 °C	428 °F	
UL RTI, Mechanical with Impact	220 °C	428 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A130 Liquid Crystal Polymer (LCP), 30% Glass I

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.62 g/cc	0.0585 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0.001 cm/cm	0.001 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Hardness, Rockwell M	87	87
Tensile Strength, Ultimate	190 MPa	27600 psi
Elongation at Break	2.3 %	2.3 %
Tensile Modulus	16 GPa	2320 ksi
Flexural Modulus	15 GPa	2180 ksi
Flexural Yield Strength	280 MPa	40600 psi
Compressive Yield Strength	100 MPa	14500 psi
Charpy Impact, Notched	4 J/cm²	19 ft-lb/in²
Tensile Impact Strength	80 kJ/m²	38.1 ft-lb/in²
Compressive Modulus	14.5 GPa	2100 ksi
Coefficient of Friction	0.14	0.14
Izod Impact, Notched (ISO)	26 kJ/m²	12.4 ft-lb/in²

Electrical Properties

Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm	
Surface Resistance	1e+017 ohm	1e+017 ohm	
Dielectric Constant	3.2	3.2	
Dielectric Constant, Low Frequency	3.7	3.7	
Dissipation Factor	0.008	0.008	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	140 sec	140 sec	
Comparative Tracking Index	175 V	175 V	

Thermal Properties

CTE, linear 20°C	0 µm/m-°C	0 µin/in-°F	
CTE, linear 20°C Transverse to Flow	79 µm/m-°C	43.9 µin/in-°F	
CTE, linear 100°C	0 µm/m-°C	0 µin/in-°F	Flow
CTE, linear 100°C	79 µm/m-°C	43.9 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	240 °C	464 °F	240/220°C (460/430°F)
Deflection Temperature at 0.46 MPa (66 psi)	252 °C	486 °F	
Deflection Temperature at 1.8 MPa (264 psi)	235 °C	455 °F	
Vicat Softening Point	232 °C	450 °F	
UL RTI, Electrical	240 °C	464 °F	
UL RTI, Mechanical with Impact	220 °C	428 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	43 %	43 %	

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistai for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We adv one of its raw conversions in your calculations to minimize rounding error. We also ask that you refer to MatWeb's disclaimer and terms of use regardir property values for this datasheet as they were originally entered into MatWeb.

Ticona Vectra® A115 Liquid Crystal Polymer (LCP), 15% Glass I

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:
Data provided by M. A. Hanna.

No vendors are listed for this material. Please **click here** if you are a supplier and would like information on how t

Physical Properties	Metric	English
Density	1.5 g/cc	0.0542 lb/in³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	0 cm/cm	0 in/in
Linear Mold Shrinkage, Transverse	0.002 cm/cm	0.002 in/in
Mechanical Properties		
Tensile Strength, Ultimate	200 MPa	29000 psi
Elongation at Break	3.3 %	3.3 %
Tensile Modulus	14 GPa	2030 ksi
Flexural Modulus	12 GPa	1740 ksi
Flexural Yield Strength	240 MPa	34800 psi
Compressive Yield Strength	85 MPa	12300 psi
Charpy Impact, Notched	5.5 J/cm²	26.2 ft-lb/in²
Tensile Impact Strength	80 kJ/m²	38.1 ft-lb/in²
Compressive Modulus	10 GPa	1450 ksi
Coefficient of Friction	0.11	0.11
Izod Impact, Notched (ISO)	55 kJ/m²	26.2 ft-lb/in²

Electrical Properties

Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm	
Surface Resistance	1e+017 ohm	1e+017 ohm	
Dielectric Constant	2.9	2.9	
Dielectric Constant, Low Frequency	3.3	3.3	
Dissipation Factor	0.008	0.008	
Dissipation Factor, Low Frequency	0.02	0.02	
Arc Resistance	135 sec	135 sec	
Comparative Tracking Index	200 V	200 V	

Thermal Properties

CTE, linear 20°C	-5 µm/m-°C	-2.78 µin/in-°F	
CTE, linear 20°C Transverse to Flow	89 µm/m-°C	49.4 µin/in-°F	
CTE, linear 100°C	-5 µm/m-°C	-2.78 µin/in-°F	Flow
CTE, linear 100°C	89 µm/m-°C	49.4 µin/in-°F	Transverse
Melting Point	280 °C	536 °F	
Maximum Service Temperature, Air	240 °C	464 °F	240/220°C (460/430°F)
Deflection Temperature at 1.8 MPa (264 psi)	230 °C	446 °F	
UL RTI, Electrical	240 °C	464 °F	
UL RTI, Mechanical with Impact	220 °C	428 °F	
Flammability, UL94	V-0	V-0	

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Ticona

Product Information

> Data Sheet Selector > Query Results

Data sheet selector allows you to view a Ticona data sheets
for any available grade by selecting a Ticona product and a Ticona grade category.

Data Sheet MSDS Literature Search

Select a product. VECTRA liquid crystal polymer (LCP)

Select a grade category. ALL » Quer

Press ▽ to sort column in ascei

Grade ▽	Description ▽ (Category: Description)
A950	Unfilled: suitable for extrusion, USP class VI compliant
C115	Glass Reinforced: 15% glass fiber, higher temperature capability & easier flow
A115	Glass Reinforced: 15% glass fiber,Provids easier flow than A130, Tougher
E130i	Glass Reinforced: 30% glass fiber, excellent flow, high temperature capability
B130	Glass Reinforced: 30% glass fiber, extremely low CLTE and shrinkage
L130	Glass Reinforced: 30% glass fiber, general purpose LCP
C130	Glass Reinforced: 30% glass fiber, higher temp. capability & easier flow than A130
H130	Glass Reinforced: 30% glass fiber, highest temperature capability
A130	Glass Reinforced: 30% glass fiber,USP class VI compliant, exc. bal. of properties
L140	Glass Reinforced: 40% glass fiber, general purpose LCP
H140	Glass Reinforced: 40% glass fiber, hightest temperature capability
A150	Glass Reinforced: 50% glass fiber, improved creep resistance over A130
C150	Glass Reinforced: 50% glass fiber, improved creep resistance over C130
T130	Glass Reinforced: An easily processable LCP with very high temperature capability. Glass Filled
A515	Mineral Reinforced: 15% mineral,USP class VI compliant
A530	Mineral Reinforced: 30% mineral ,USP class VI compliant, hydrolytically stable
E530i	Mineral Reinforced: 30% mineral, excellent flow, high temperature capability
C550	Mineral Reinforced: 50% mineral, suitable for higher temperature
A410	Mineral / Glass Reinforced: 25% glass/25% mineral. low warpage
A725	Specialty: 25% filled, conductive grade
A625	Specialty: 25% graphite, good wear characteristics
A230	Specialty: 30% carbon fiber, USP ClassVI compliant,conductive
B230	Specialty: 30% carbon fiber,exceptional strength and stiffness, conductive
A700	Specialty: 30% glass fiber, suitable for electrostatic dissipation (ESD)
D130M	Specialty: 30% milled glass, very high flow, suitable for encapsulation
E820i Pd	Specialty: 40 % mineral , excellent flow, electrolytic metal platable
E820i	Specialty: 40% mineral, excellent flow, electrolytic metal platable
C810	Specialty: Glass/mineral, electroplatable, withstands reflow soldering
A435	Specialty: Glass/PTFE, best high High Arc Ignition performance
A430	Specialty: LCP/PTFE, excellent wear& electrical prop. at hi freq